

Serial No. 09/847,182

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more by weight of Fe_2O_3 as a core-forming mixture and thereafter forming the core-forming mixture into a sand core.

14. (Once Amended) The method of claim 13 wherein an anti-veining material comprises about 1% to about 3.5% by weight of the lithia-containing material and about 1% by weight or more of Fe_2O_3 .

15. (Once Amended) The method of claim 14 wherein the lithia-containing materials is selected from a group consisting of α -spodumene, amblygonite, montebrasite, petalite, lepidolite, zinnwaldite, eucryptite and lithium carbonate.

REMARKS

Applicants have amended paragraph 0005 on page 2 to eliminate the sentence, "It is believed that lithia-containing, anti-veining agents as described in U.S. Patent No. 5,911,269 are sold under the trademark VEINSEAL® 14000 by International Gypsum Company, Inc. of Milwaukee, Wisconsin." The Material Safety Data Sheet showing the composition of the commercial VEINSEAL 14000 anti-veining agent used in the invention has been obtained from its manufacturer and is made of record herein. The commercial VEINSEAL 14000 product differs from the composition that is disclosed in U.S. Patent No. 5,911,269.

Paragraphs 1 and 2 of Office Action

In paragraphs 1 and 2 of the Office Action, the Examiner rejects claims 1, 5, 10 and 12-14 under 35 U.S.C. §112, second paragraph, as follows:

Claims 1, 5, 13 and 14 are rejected as indefinite because of the recitation of "at least about 1% of ferric oxide;"

Claims 1, 13 and 14 are rejected as indefinite because of the recitation of "less than about" in referring to ferric oxide; and

Claim 10 is rejected as indefinite because of the recitation of "an effective amount of binder."

Claim 12 is rejected because of its recitation of the trademark "VEINSEAL® 14000."

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For the sole purpose of responding to the Examiner's formal objections, Applicants have amended claims 1, 5, 13 and 14 to recite "about 1% or more" in place of "at least about," which does not change either the scope or the meaning of the claims. Applicants respectfully traverse the rejection of claims 1, 5, 13 and 14 because of their use of what is now "about 1% or more," and "less than about." The use of "about" does not subject claims to a rejection under the second paragraph of Section 112. For example, in Ex Parte Shelton, 92 U.S.P.Q. 374, 375 (B.P.A. 1950), the Patent Office Board of Appeals, in considering the rejection of claims for lack of particularity, stated, "The Examiner criticizes such terms as 'about' and 'approximately.' We find no objection to the use of these terms." Likewise, in Ex Parte Eastwood, Brindle, and Kolb, 163 U.S.P.Q. 316, 317 (B.P.A. 1968), the Board of Appeals stated, "The descriptive word 'about' is not indefinite as argued by the examiner. Its meaning is not as broad and arbitrary as contended by the examiner. Rather, the term is clear and flexible and is deemed to be similar in meaning to terms such as 'approximately' or 'nearly.'"

Applicants respectfully submit that claims 1, 5, 13 and 14 comply with the second paragraph of 35 U.S.C. §112 and request that the Examiner's objections to these terms be withdrawn.

Applicants also respectfully traverse the Examiner's rejection of claim 10 because it recites "an effective amount of binder" on the basis that it is not clear what this amount is or what it is supposed to achieve.

The recitation of "an effective amount of binder" in claim 10 is not indefinite and objectionable under the second paragraph of 35 U.S.C. §112. For example, in In re Watson, 186 U.S.P.Q. 11, 20 (C.C.P.A. 1975) the Court of Customs and Patent Appeals, in considering whether the phrase "an effective amount" used in an independent claim 1 was indefinite under 35 U.S.C. §112, second paragraph, held

"The present case is distinguishable, however, since claim 1 recites 'an effective amount of a germicide suitable for use in oral hygiene.' The very term 'germicide,' used in this claim, indicates that germicidal action is the effect sought to be produced. Hence, the recitation points out both the effect sought to be produced and the purpose of that effect, viz, germicidal action in oral hygiene.

Moreover, the claim language must be read in light of the application disclosure as it would be interpreted by one of ordinary skill in the art. See In re Moore, 58 C.C.P.A. 1042, 439 F.2d 1232, 169 U.S.P.Q. 236 (1971). Those skilled in the art will be able to determine from the disclosure including the examples, what an effective amount of germicide is."

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For the reasons expressed by the C.C.P.A. in its Watson decision, Applicants use of "an effective amount of binder" in claim 10 is not indefinite and subject to objection under the second paragraph of 35 U.S.C. §112. The very use of the term "binder" indicates that binding action is the effect sought to be produced, and clearly one skilled in the art can determine, if not from their experience with this everyday casting consideration, from the many examples on pages 5-6 of the specification of this application, what an effective amount of binder is.

Applicants respectfully submit that claim 10 complies with the second paragraph of 35 U.S.C. §112 and request that the Examiner's objections to claim 10 be withdrawn.

In response to the Examiner's rejection of claim 12 for its recitation of a trademark, Applicants have amended claim 12 to recite the composition that comprises the VEINSEAL 14000 and have submitted a declaration of one of the inventors, pursuant to 35 U.S.C. §132 and a true copy of the Material Safety Data Sheet of the supplier of the VEINSEAL 14000 product that sets forth its composition.

Applicants respectfully submit that claim 12, as amended, complies with the second paragraph of 35 U.S.C. §112, and request that the Examiner's objection thereto be withdrawn.

Paragraph 3 of the Office Action

In paragraph 3 of the Office Action, the Examiner objects to claim 2, 6, 7 and 9, under 37 CFR §1.75(c) as being improperly dependent for failing to further limit the subject matter of the claims from which they depend.

The objections to claims 2 and 6 are obviated by the amendments of claims 1 and 5 to recite "about 1% or more by weight of ferric oxide" because the recitations of "about 1% by weight of ferric oxide" in claims 2 and 6 clearly further narrow the scope of the inventions they recite compared to the inventions recited in claims 1 and 5.

The objections to claims 7 and 9 are also obviated by the amendment of claim 5 to recite "about 1% to about 3.5% by weight" because the recitation of "about 1% to about 2.5% by weight" in claim 7 and the recitation of "about 1% by weight" in claim 9 clearly further narrow the scope of the inventions they recite compared to the invention recited in claim 5.

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The amendment to claim 5 is supported in the specification, for example, at page 3, line 4 of paragraph 0007. Applicants respectfully submit that claims 2, 6, 7 and 9 now comply with 37 CFR §1.75(c), and respectfully request the Examiner withdraw her objections thereto.

Paragraph 4 of the Office Action

In paragraph 4 of the Office Action, the Examiner objects to a typographical error in the claim by which the claim recites, ". . .supmene." Claim 15 has been amended to correct this typographical error.

Paragraph 5 of the Office Action

In paragraph 5 of the Office Action, the Examiner objects to the specification at page 2, line 17 (in paragraph 0005) because of its recitation of ". . . a group consisting of . . .supmene. ." Applicants have amended paragraph 0005 to recite in the portion corresponding to page 2, line 17 of the specification to recite, ". . . group consisting of .α.spodumene. . ."

Paragraphs 6-10 of the Office Action

Paragraphs 6-10 of the Office Action relate to the patentability of the claims of this application and the Examiner's rejections of the claims under 35 U.S.C. §103. No claims are presently allowed.

Paragraph 8 of the Office Action

The Examiner's presumption is correct. The subject matter of the claims of this application were commonly owned by the International Truck and Engine Corporation at the time of their invention by the applicants.

Paragraph 9 of the Office Action

In paragraph 9, the Examiner rejects claims 1, 2, 4-8 and 10-15 under 35 U.S.C. §103(a) as unpatentable over Brander et al. (U.S. Patent No. 5,911,269). For the reasons that follow, Applicants respectfully submit that their claimed invention was not obvious in view of Brander '269.

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Applicants have discovered that by combining as little as 1% of Fe_2O_3 with less than about 4% of a lithia-containing material (preferably about 1% to about 3.5%), they unexpectedly achieved substantially veinless castings and substantially reduced costs. Past methods have required the use of at least about 5% of an expensive lithia-containing material, such as VEINSEAL 14000, and Applicants' use of the claimed invention has resulted in unexpected savings from about \$175,000 to about \$500,000 per year as a result of the reduced use of expensive lithia-containing material. (Percentages are by weight based on the weight of sand.) As set forth in the declaration of Mr. Stephen G. Baker, one of the inventors, VEINSEAL 14000 is a product of IGC Technologies, Inc., which, according to its Material Safety Data Sheet, comprises 60-50% SiO_2 , 10-20% Fe_3O_4 , 15-25% Al_2O_3 , 10-25% TiO_2 , and 2-5% LiO . As indicated by its Material Safety Data Sheet, VEINSEAL 14000 contains no Fe_2O_3 .

Brander '269 does not disclose, teach or suggest Applicants claimed invention.

Brander '269 discloses that the formation of veins in gray iron castings is reduced by the use of a lithia-containing material in a sand core. Brander indicates at Col. 3, lines 4-12, that lithia in the form of α -spodumene controls silica expansion by the absorption of free silica to create beta-spodumene, which has an extremely low thermal expansion.

Brander '269 presents the results of experiments investigating the effect of the addition of lithia-containing materials on the creation of casting veins, primarily with a lithia-containing material which Brander indicates to be a combination of 88% α -spodumene and 12% black iron oxide (Fe_3O_4) sold under the trademark "Veinseal 12000" and a modification thereof, "Veinseal 12000 EXP," which Brander indicates to be a combination of 78% α -spodumene, 10% lithium carbonate (LiCO_4) and 12% black iron oxide (Fe_3O_4).

As a result of his experiments, Brander states,

"The study indicates that as the percentage of Veinseal 12000 is added to the mixture, veining and penetration is reduced." (Col. 5, lines 59-61).

"Veinseal 12000 was found to be the most effective in reducing veining." (Col. 6, lines 66-67).

"It should also be noted from the data shown with respect to additives 5 and 6, as the amount of lithia decreases, veining in the castings increases." (Col. 7, lines 48-50).

"The results indicate that Veinseal 12000 EXP at 1.5% resin and 3% B.O.S. showed the best results," referring a comparison of the addition of 3% Veinseal with the addition of 2% Veinseal. (Col. 8, lines 35-37).

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"The results are shown in Table 6, and as illustrated therein Veinseal 12000 minimized veining," referring to a comparison between the addition of Veinseal 12000 additive and two non-lithia-containing additives. (Col. 8, lines 66-67).

Brander's Experiment 7 compared several additive combinations that included Veinseal with a standard starch-based additive MACOR and indicated that greater amounts of Veinseal additive provided improved results. (See mix numbers 5, 9 and 10.)

There is no reference in Brander '269 to Fe_2O_3 as an element of Brander's improved lithia-containing anti-veining agent. Thus, Brander '269 does not disclose, teach or suggest combining Fe_2O_3 with a lithia-containing material, particularly so as to reduce the amount of the lithia-containing material being used.

Moreover, the Brander '269 patent itself establishes that Applicants' claimed invention was NOT obvious. The disclosure of the Brander '269 patent followed at least seven years of effort by the Industrial Gypsum Company, now IGC Technologies, Inc., to solve the problem of veining defects. This long development effort is evidenced by the Brander U.S. Patent No. 4,735,937, filed in November 1985, and the Brander '269 patent, filed in September 1996 as a continuation-in-part of a series of applications filed beginning in November, 1992. Significantly, while Brander disclosed an anti-veining agent in U.S. Patent No. 4,735,973, which included as one of its ingredients Fe_2O_3 , his long effort to develop an improved anti-veining agent led to a lithia-containing anti-veining agent that made no use of Fe_2O_3 . Applicants' claimed invention was clearly not obvious to Brander, and the Brander '269 patent does not establish the obviousness of Applicants' claimed invention.

There are a number of statements in the Office Action that Applicants' believe indicate an erroneous basis for the rejection of Applicants' claims. It is stated on page 6, for example:

"Second component of the addition is iron oxide, wherein the specification teaches that the currently accepted method of making foundry cores and molds employ the addition of 1-3% iron oxides (Fe_2O_3). The prior art of Brander '269 does not teach away from this method and utilized iron oxide in the examples."

Applicants respectfully disagree. Brander '269 does teach away from the prior art addition of 1-3% iron oxides (Fe_2O_3), which Brander clearly discloses has "met with limited success in reducing veining" (Col. 1, lines 50-51), and Brander '269 clearly teaches that the prior

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art method, which has met with limited success, is to be replaced by his more effective method disclosed in the '269 patent which uses a "lithia-containing material," (but no Fe_2O_3). Contrary to the Examiner's statement, Brander '269 teaches only the use of Veinseal 12000, which is a combination of 88% α -spodumene and 12% black iron oxide (Fe_3O_4), as set forth by Brander at Col. 1, lines 27-28, and the use of Veinseal 12000 EXP which is a combination of 78% α -spodumene, 10% lithium carbonate (Li_2CO_3) and 12% black iron oxide (Fe_3O_4).

Brander did not disclose, teach or suggest any combination of a lithia-containing material and Fe_2O_3 as an anti-veining additive.

The Examiner also states:

"With respect to the recitation of the ferric oxide, it should be pointed out that both the ferric oxide and iron oxide of the prior art of Brander '269 have chemical formulas of Fe_2O_3 . Therefore, the difference between the two components is purely nomenclature."

Applicants respectfully disagree. The Examiner's statement does not correctly reflect the disclosure of Brander '269. Brander '269 does not use "ferric oxide" anywhere in the patent. Brander '269 states that the iron oxides used in the prior art comprise "red iron oxide also known as hematite (Fe_2O_3), black iron oxide, also known as magnetite (Fe_3O_4), and yellow ochre." (Col. 1, lines 26-28). As indicated above, Brander '269 discloses only the use of black iron oxide (Fe_3O_4) with lithia-containing material. Applicants' amended claims now recite Fe_2O_3 as part of the claimed invention, and the difference between Fe_3O_4 and Fe_2O_3 is not mere nomenclature, as established by Applicants' invention.

The Examiner further states:

"With respect to the recitation of Veinseal 14000, although the use of trademarks has been addressed in paragraph 2, the actual mineral components containing the lithia compound is the same in both the present invention and in the prior art of Brander '269."

While α -spodumene (or the other lithia mineral) may be present in the Veinseal 12000 and Veinseal 12000 EXP materials disclosed in Brander '269 and in the Veinseal 14000 material used by Applicants in their invention, the composition of the commercial Veinseal 14000 product used by Applicants in their invention is different from the Veinseal 12000 and Veinseal 12000 EXP material that Brander discloses, as demonstrated by a comparison of Brander '269

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with the Material Safety Data Sheet included with Mr. Baker's declaration. If the Examiner is asserting that the Veinseal 14000 additive included by Applicants in their invention is the same as the Veinseal 12000 and Veinseal 12000 EXP additives disclosed by Brander, Applicants must, respectfully, disagree.

The Examiner still further states:

"Use of a lithium-containing component in conjunction with iron or ferric oxides in Brander '269 constitutes an additive, which when incorporated into said cores and molds reduces thermal expansion defects such as veining, scabs and buckles."

As indicated above, Brander does not disclose the use of lithia-containing components with anything but Fe_3O_4 as an additive for sand cores. Thus, Brander does not disclose, teach or suggest Applicants claimed combination of a lithia-containing material such as Veinseal 14000 with about 1% or more Fe_2O_3 to reduce thermal expansion defects.

Finally, the Examiner states:

In the light of the above disclosure it would have been obvious to one having ordinary skill in the art to utilize the prior art of Brander and thereby obtain the invention at hand."

Clearly, the statement represents an incorrect conclusion. One skilled in the art utilizing the Brander prior art would not obtain Applicants claimed invention. Brander does not disclose, teach or suggest Applicants' combination that incorporates about 1% or more Fe_2O_3 with reduced amounts of lithia-containing material such as Veinseal 14000 to achieve castings substantially free of veining at substantially reduced costs. As set forth in Mr. Baker's declaration, the unexpected cost savings in material costs alone that have been achieved with the use of the invention are \$300,000 to \$400,000, with, if anything, an improvement in the casings. Accordingly, Applicants' claimed invention, as defined in Claims 1, 2, 4 - 8 and 10 - 15 was not obvious in view of the cited references.

Paragraph 10 of the Office Action

In paragraph 10 of the Office Action, the Examiner rejects claims 3 and 9 under 35 U.S.C. §103(a) in view of Brander '269 and Brander's U.S. Patent No. 4,735,973.

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Neither Brander '269 nor Brander '973 disclose, teach or suggest a sand core comprising equal amounts of a lithia-containing material and Fe_2O_3 combined with lake sand as in claim 3, or a mixture for forming a sand core comprising lake sand, about 1% by weight of a lithia-containing material and about 1% or more of Fe_2O_3 . As indicated above, Brander '269 teaches that a sand core composition has reduced veining defects as a lithia-containing composition is increasingly added and teaches the use of only Fe_3O_4 with the lithia-containing material.


Further, Brander '973 teaches the use of titanium dioxide as an anti-veining agent and does not teach the use of lithia-containing materials as an anti-veining agent. Applicants respectfully submit that claims 3 and 9 were not obvious in view of Brander '269 and Brander '973. Furthermore, claims 3 and 9 depend from patentable claims 1 and claims 5 and 6, respectively, and are patentable for the same reasons set forth above.

Summary

Applicants respectfully submit that the claims of the application are now definite and recite an invention that is patentably distinguished from the cited references and respectfully requests allowance of this application.

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REDLINE VERSION OF AMENDMENTS

[0005] U.S. Patent No. 5,911,269 discloses a method of making silica sand cores utilizing lithium-containing materials that provide a source of lithia (Li_2O) to improve the quality of castings by reducing sand core thermal expansion and the veins resulting therefrom in metal castings. The disclosed method of making sand cores comprises the steps of preparing an aggregate of sand core and a resin binder, and mixing into the aggregate a lithium-containing additive selected from a group consisting of α -spodumene, amblygonite, montebrasite, petalite, lepidolite, zinnwaldite, eucryptite and lithium carbonate, in the amount to provide from about 0.001% to about 2% of lithia. The use of such a method and lithia-containing additives is described as reducing the casting defects associated with thermal expansion of silica, including the formation of veins in the cavity and improving the surface finish of the castings. [It is believed that lithia-containing anti-veining agents as described in U.S. Patent No. 5,911,269 are sold under the trademark Veinseal® 14000 by the Industrial Gypsum Company, Inc. of Milwaukee, Wisconsin.]

[0005a] Veinseal® 14000 is an effective, but expensive, anti-veining agent, costing about \$650 per ton, and in the operation of a modern foundry, producing tens of thousands of internal combustion engine blocks and cylinder heads per year, the use of such anti-veining agents at the minimum effective concentration of 5% by weight of the sand cores can cost as much as \$700,000 per year.

IN THE CLAIMS

(Currently Amended) A sand core for metal casting, comprising less than about 4% by weight of a lithia-containing material at least about 1% or more by weight of ferrie oxide Fe_2O_3 and the balance of core sand and a core sand binder, all formed into a sand core.

2. (Currently Amended) The sand core of claim 1 wherein the amount of ferrie oxide Fe_2O_3 comprises about 1% by weight.

3. (Original) Claim filed with the application following the specification.

4. (Original) Claim filed with the application following the specification.

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5. (Currently Amended) A mixture for forming a sand core, comprising about 1.5% 1.0% to about 3.5% by weight of a lithia-containing material, at least about 1% or more by weight of ~~ferrie oxide~~ Fe_2O_3 , and the balance of core sand and a core sand binder.

6. (Currently Amended) The mixture of claim 5 wherein the amount of ~~ferrie oxide~~ Fe_2O_3 comprises about 1% by weight.

7. (Original) Claim filed with the application following the specification.

8. (Original) Claim filed with the application following the specification.

9. (Original) Claim filed with the application following the specification.

10. (Currently Amended) A method of making a sand core for casting, comprising uniformly mixing together a core sand, an effective amount of binder, about 1% to about 3.5% by weight of a lithia-containing material, and about 1% by weight of ~~ferrie oxide~~ Fe_2O_3 as a core-forming material, and forming the core-forming material into a sand core.

11. (Original). Claim filed with the application following the specification.

12. (Currently Amended) The method of claim 10 wherein the lithia containing material is the VEINSEAL® 14000 product of Industrial Gypsum, Inc. comprises 2-5% of Li_2O , 10-25% of TiO_2 , 15-25% of Al_2O_3 , 10-20% of Fe_3O_4 , and 60-70% of SiO_2 .

13. (Currently Amended) A method of making a sand core for casting, comprising uniformly mixing together a core sand, an effective amount of core sand binder, an anti-veining material comprising less than about 5% by weight of a lithia-containing material and at least about 1% or more by weight of ~~ferrie oxide~~ Fe_2O_3 as a core-forming mixture and thereafter forming the core-forming mixture into a sand core.

14. (Currently Amended) The method of claim 13 wherein an anti-veining material comprises about 1% to about 3.5% by weight of the lithia-containing material and at least about 1% by weight or more of ~~ferrie oxide~~ Fe_2O_3 .

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15. (Currently Amended) The method of claim 14 wherein the lithia-containing materials is selected from a group consisting of ~~spodumene~~ α-spodumene, amblygonite, montebrasite, petalite, lepidolite, zinnwaldite, eucryptite and lithium carbonate.